Appendix D

Fish and Wildlife Coordination Act Report

FISH AND WILDLIFE COORDINATION ACT REPORT

Ponce Inlet Navigation Study

U.S. Fish and Wildlife Service
Ecological Services Division
Jacksonville Field Office
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PONCE DE LEON INLET IMPROVEMENTS

VOLUSIA COUNTY, FLORIDA

Project Description

The proposed project is located on land and adjacent coastal waters of the Atlantic ocean in the vicinity of Ponce de Leon Inlet, at S33, T16S, R34E (Figure 1). The 1993 U.S. Army Corps of Engineers (USACOE) Reconnaissance Report considered various alternatives intended to stabilize the navigation channel near the center of the inlet's mouth and throat, stop the erosion of the inlet's north spit and prevent shoaling resulting from a possible breakthrough of the old bed of the Halifax River with either the inlet or Atlantic Ocean, and eliminate the undermining and settling of the north jetty. The alternatives proposed for consideration include:

- extending the north and south jettys,
- re-opening a portion of the north jetty weir,
- constructing a scour apron on the south side of the north jetty and rebuilding the damaged portions of the north jetty,
- building a groin field along the east shoreline of the north spit within the inlet throat,
- constructing a revetment from the toe end of the north jetty westward along one of three possible alignments, and
- creating a new Federal channel through the old Halifax riverbed.

Description of the Affected Environment

The environment in and around Ponce de Leon Inlet is comprised of both natural and artificial (man-made) habitats. The naturally-occurring systems include open water (sub-littoral zone) and benthos associated with the Atlantic Ocean, inlet mouth and throat, the Indian and Halifax Rivers, and north spit coves; sand beach and tidal flats (littoral zone); coastal sand dunes; and tidal marshes. Artificial habitats include spoil uplands on both north and south spits and on estuarine marsh islands; two rock jettys; a beach-quality sand barrier on the north spit; and various boardwalks, buildings, parking lots, and docks associated with Lighthouse Point and Smyrna Dunes county parks, a U.S. Coast Guard Station, and commercial fishing facility and boat yard.

Natural Habitats

Open Water

The Atlantic Ocean in and around Ponce Inlet is characterized by a north/south longshore current and gradually sloping bottom within 1000 yards of the shore and out to the 4-fathom depth contour. Currents at the inlet mouth have velocities from 1.0 to 2.5 feet per second (fps) and depths between about 6 to 26 feet that tend to increase from the South to the North Jetty. Both

depths and speed of current are highly variable within the inlet throat, varying between less than a foot to over forty feet, and between 0.5 and 4.5 fps, respectively (Figure 2). Water depth in the north Indian River is greater (18 versus 14 feet) and more uniformly distributed between shorelines, than the Halifax River (Figure 3). The distribution of water currents in both rivers is similar, although the Halifax River has greater velocities (3.0 versus 2.0 fps) which change rapidly near shorelines (USACOE 1993). Water depth and velocities at their confluence varies, depending upon location. Average water depths within the two north spit coves (Figures 4 and 5), including the man-made channels, are estimated at five feet.

Net phytoplankton (>20 microns) which may occur in the project area include diatoms of the genera *Skeletonema*, *Thalassiosira*, *Chaetoceros*, *Prorocentrium*, *Nitzschia*, and *Bacillaria* (Steward and VanArman 1987). Other genera prevalent in the lower St. Johns River Basin which also may occur in the vicinity of Ponce de Leon inlet include *Rhizosolenia*, *Melosira*, *Coscinodiscus*, *Thalassionema*, *Thallasiotrix*, and *Gyrosigma* (Department of the Navy 1996). Nanophytoplankton (<20 microns) in one Indian River Lagoon study (Mahoney and Gibson 1983b) accounted for 99% of cell numbers and 91% of the biomass. Mahoney and Gibson (1983a) also identified 232 species of diatoms and 20 species of dinoflagellates in that study. Abundance can vary seasonally and diversity is dependent upon salinity and the type and availability of nutrients (Department of the Navy 1996). Temperature, light penetration, and nutrient load are the principle factors in water which affect phytoplankton abundance and productivity (Steward and VanArman 1987). The nutrient input from New Smyrna Beach and its proximity to the project area may have a positive impact on phytoplankton within the vicinity of Ponce Inlet.

Copepods of various sizes typically dominate the zooplankton (Steward and VanArman 1987, Department of the Navy 1996). Other significant components include the larvae of benthic invertebrates such as arroworm (*Sagitta* sp.), cirripids, tintinnids, coelenterates, immature stages of crab and shrimp, and various fish eggs. The larval stages of local fish species, known as ichthyoplankton, also may significantly contribute to the zooplankton biomass. Zooplankton density and diversity are generally higher away from inlets and may vary year to year, though their seasonal abundance is usually greatest in spring, and summer or autumn. Abundance around Ponce Inlet may be related to phytoplankton levels and nutrients from nearby cities.

Ocean access, marshes, creeks, varying water depth and bottom contours, and rock jettys are all likely to contribute to the diversity of fish which could occur within the project area. Some of these fish include pinfish, mosquito fish (*Gambusia affinis*), silver perch (*Bairdella chrysura*), mullet (*Mugil* spp.), Atlantic croaker (*Micropogonias undulatus*), menhaden (*Brevoortia* spp.), sea robins (*Priono tribulus*), lizardfish (*Synodus foetens*), ladyfish (*Elops saurus*), sheepshead (*Archosargus probatocephalus*), flatfishes (Bothidae), mackerel (*Scomboromorus* spp.), juvenile snapper and grouper, sea bass (Lutjanidae and Serranidae), bluefish (*Pomatomus saltatrix*), seatrout and weakfish (*Cynoscion* spp.), common snook (*Centropomus undecimalus*), red and black drum (Sciaenidae), cobia (*Rachycentron canadum*), and various sharks (Comp and Seaman 1985, Florida Department of Environmental Protection 1993).

Other animals inhabiting open water within the Ponce Inlet project area include the federally-endangered West Indian manatee, *Trichechus manatus latirostris* (Humphrey 1992), four federally-listed sea turtles: the endangered green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*), and leatherback (*Dermochelys coriacea*) turtles and the threatened loggerhead (*Caretta caretta*) turtle (Moler 1992), and the diamondback terrapin (*Malaclemys terrapin*) (Behler and King 1979).

Benthos

A site inspection of spoil material from previous dredgings revealed bottom sediments from the nearshore ocean, Ponce Inlet mouth and throat, and river confluence to be mainly unconsolidated sands or sand-shell combinations. Erosion and runoff from adjacent marshes and uplands contribute organic material to the bottom sediment of both rivers and the north spit coves. The rate of accumulation of this material in coves is usually greater due to input from surrounding areas exceeding removal due to the smaller influence of tides and wind on water currents. This accumulation produces an overlying, soft-bottomed "muck layer" of varying thickness.

The benthic community includes those organisms living on the surface of and within bottom sediments. Sediment composition and stability, salinity, light, temperature, oxygen and other chemical concentrations, and nutrient levels are factors which influence species abundance and diversity. Organisms associated with Ponce Inlet are, for the most part, continually exposed to full ocean salinities that likely fluctuate very little. In general, abundance and density are expected to be greatest during winter and spring and lowest towards the end of summer. Some of the benthic organisms expected in and around Ponce Inlet include polychaete worms in the genera *Polycirrus*, *Pectinaria*, *Polychaete*, and *Nereis*; bivalves including oysters (*Crassostrea virginica*), various clams, and mussels (*Mytilus* spp.); various gastropods (snails); crustacea (shrimps, crabs, amphipods, ostracods, and tanaids); echinoderms (starfish and sand dollars); and seagrasses in the genera *Halophila* and *Zostera* (Steward and VanArman 1987, Department of the Navy 1996).

Beach

The beach around Ponce Inlet consists primarily of unconsolidated sand with some shell material extending from mean low water landward to where there is a marked change in material or physiographic form, or to the line of permanent vegetation. Areas of beach exist north and south of the north jetty (Figure 6) and completely around the inlet's south spit to the Coast Guard station on the north Indian River (Figures 3 and 7). Under natural conditions, the combined action of wind, waves, and current produce frequent changes in the size, shape, slope, and location of inlet beaches. Since completion of the Ponce Inlet jetty system in the early 1970's, sand accretion on the south spit has extended the beach area northward both east and west of the spit. While the beach north of the North Jetty has widened somewhat in the vicinity of the jetty, nearly all the natural beach south and west of the jetty is gone (USACOE 1993). A narrow, artificial beach has been maintained near the toe end of the jetty by the addition of beach-quality sand deposited in 1993 (Figures 8 and 9), as a barrier between the inlet and a county parking lot

(Richard Powell, U.S. Army Corps of Engineers, personal communication). Daytime beach driving is currently permitted on the ocean-side of each spit up to the jettys (Volusia County Government 1992).

Animals associated with the beach community include birds, crustaceans, molluscs, sea turtles and beach mice. Specific birds which may occur at Ponce Inlet include gulls (*Larus spp.*); the black skimmer (*Rynchops niger*); American oystercatcher (*Haematopus palliatus*); terns (*Sterna spp.*); plovers in the genera *Pluvialus* and *Charadrius*, including the federally threatened piping plover (*C. melodus*); sandpipers in the genera *Tringa*, *Calidris*, and *Actitis*, marbled godwit (*Limosa fedoa*), willet (*Catotrophorus semipalmatus*), and ruddy turnstone (*Arenaria interpres*) (Stevenson and Anderson 1994). The pallid beach mouse (*Peromyscus polionotus decoloratus*), which once occurred from north Ponce Inlet to the Matanzas Inlet, is now considered extinct. South Ponce Inlet is the northern limit of the southeastern beach mouse, (*Peromyscus polionotus niveiventris*), a federally threatened species (Stout 1992). Bivalves, specifically clams of various species appear to be the most abundant mollusc at Ponce Inlet beaches. Most insects found at beach habitats are transients. Crustaceans inhabiting the littoral zone include, hermit crabs (*Pagurus longicarpus* and *Clibanarius vittatus*), and ghost crabs (*Ocypode quadrata*) (Williams 1984).

Tidal Flats

Sand flats (Figure 10) are normally submerged, sand-bottomed areas which are completely exposed during mean low water, and may be separated from marsh or beach by continuously submerged bottom. A series of large and small sand flats exist within the project area, principally north and south of Rockhouse Creek on the west side of the Halifax and north Indian Rivers. A review of an 1851 U.S. Coast Survey map of Mosquito Inlet (Ponce Inlet) revealed a similar pattern of flats, though flats south of Rockhouse Creek today appear longer and wider. A flat may have existed at one time within the inlet throat adjacent to the south spit beach, but further sand accretion appears to have filled in the submerged area and produced a northward extension of that beach.

Mud flats (Figure 11) are also tidally-exposed areas whose bottom substrate has an upper layer rich in silt and organic material. These flats typically occur along the edges of creeks, coves, rivers, and similar places where the rate of deposition of silt and organic material from adjacent marshes, swamps, and uplands exceeds their removal. Mud flats are present within the marina cove and the old bed of the Halifax River.

Animals expected to occur on Ponce Inlet sand flats during low water include benthic invertebrates such as some bivalves, crustacea, echinoderms, and polychaete worms, and vertebrates including birds and transient terrestrial species such as raccoons (*Procyon lotor*). Besides most of the previously mentioned birds, others which may are found on sand flats include the double-crested cormorant (*Phalacrocorax auritus*), American avocet (*Recurvirostra americana*) and short-billed dowitcher (*Limnodromus griseus*) (Stevenson and Anderson 1994). Higher plants were not observed on the sand flats, though it is likely that various species of algae

could and do occur there. Mud flats are likely to support a similar group of animals, though species composition will likely be different and total diversity may be higher due to the substrate's greater organic component.

Coastal Sand Dunes

The location and extent of sand dunes at Ponce Inlet prior to human intervention depended entirely on the interactions among wind, waves, changes in sea level, and specially-adapted vegetation. Today, in addition to these factors, dunes are strongly influenced by human activities such as construction of buildings, boardwalks, roads, parking lots, and jettys; beach driving and pedestrian foot traffic; and artificial deposition of sand for beach re-nourishment and other dredged spoil disposal. No natural dunes currently exist on the north spit south and west of the north jetty. An area of foredune and partially impacted backdunes and stable dunes exist approximately one mile north and a half mile west of the north jetty (Figure 12). Much of this habitat lies within Lighthouse Point County Park. A foredune encompasses the entire south spit, extending from the U.S. Coast Guard Station on the north Indian River through the southeastern boundary of Smyrna Dunes County Park (Figure 13). Backdunes and stable dunes in this area are naturally limited by marsh along the northwestern border and human impacts elsewhere, particularly a large spoil disposal field which includes a substantial portion of the center of the county park. Dunes formed by sand accreted since completion of the south jetty in 1969 have now partially or wholly buried more than 90% of the south jetty. Much of this area lies within the county park, which has leased the land from the Federal government.

Coastal sand dunes are the principal habitat of beach mice. The southern spit at Ponce Inlet represents the historical northernmost distribution of the federally threatened southeastern beach mouse (*Peromyscus polionotus niveiventris*). The current distribution in Volusia County extends only to the northern boundary of Cape Canaveral National Seashore, approximately 16 km south of Ponce Inlet (Stout 1992, U.S. Fish and Wildlife Service 1993). The dune ecosystem present within Smyrna Dunes Park on the south spit appears capable of supporting at least a small population of beach mice. Scattered burrows were observed on the back sides of the existing foredunes. Without a significant trapping effort, it is not clear whether these burrows were excavated by beach mice, ghost crabs, or perhaps other rodents. Rodents which may occur in the area are the cotton rat (*Sigmodon hispidus*), cotton mouse (*Peromyscus gossypinus*), and house mouse (*Mus musculus*) (Hall 1981). Other animals observed or likely to occur within the dune ecosystem include feral cats (*Felis felis*), red fox (*Vulpes vulpes*), resident and neotropical migrant birds such as sparrows and warblers (Emberizidae), gopher tortoise (*Gopherus polyphemus*), snakes, lizards, and numerous invertebrates.

Vegetation observed along the foredunes included sea oats (*Uniola paniculata*), sea rocket (*Cakile edentula*), seaside spurge (*Chamaesyce* spp.), coastal dropseed (*Sporobolus virginicus*), railroad-vine (*Ipomea pes-caprae*). and panic grass (*Panicum* spp.). Due to the generally disturbed nature of the interior portions of the south spit, the vegetative difference between transitional or backdunes and stable dunes was not always clear. Species observed were characteristic of both saw palmetto, wax myrtle and oak scrub zones and included saw palmetto

(*Serenoa repens*), broomsedge (*Andropogon* spp.), partridge-pea (*Cassia* spp.), prickly-pear (*Opuntia* sp.), yaupon (*Ilex vomitoria*), dune greenbrier (*Smilax auriculata*), pennywort (*Hydrocotyle* spp.), cabbage palm (*Sabal palmetto*), groundsel tree (*Baccharis halimifolia*), southern red cedar (*Juniperus silicicola*), wax myrtle (*Myrica cerifera*), and myrtle oak (*Quercus myrtifolia*).

Tidal Marsh

A review of aerial photographs of Ponce Inlet between 1967 and 1973, revealed that the pre-jetty tidal marsh was limited to portions of the north spit perimeter on the Halifax River and the southern section of the old riverbed cove, either side of the northernmost riverbed cove, and some interior portions of the north spit which were inundated from the southern cove through a then existing tidal creek. Following jetty construction, the area of tidal inundation apparently increased and, along with advanced sediment deposition, converted most of the sand spit into a tidal marsh. Today more than half the marsh and almost all the narrow, inlet-facing beach has been lost to erosion. Less than 20 acres of low salt marsh and mangrove swamp remain in and around the north spit (Figure 14).

Tidal marsh on the south spit is limited to a triangular area less than 10 acres on the spit's west side and mostly north of the Coast Guard Station. A small, open-water, brackish pond has formed at the landward marsh end near a boardwalk (Figure 15). Marsh formation occurred sometime after construction of the south jetty, probably from the conversion and convergence of two open-water coves from sediment buildup due to sand accretion at their juncture with the north Indian River.

Vegetation found within the low salt marsh included smooth cordgrass (*Spartina alterniflora*), glasswort (*Salicornia* spp.) and sea purslane (*Sesuvium portulacastrum*). High marsh plants observed included saltwort (*Batis maritima*), salt grass (*Distichlis spicata*), salt meadow cordgrass (*Spartina patens*), sand cordgrass (*Spartina bakerii*), salt marsh fimbristylis (*Fimbristylis castanea*), sea oxeye (*Borrichia frutescens*), groundsel bush (*Baccharis halimifolia*), marsh elder (*Iva frutescens*), wax myrtle (*Myrica cerifera*), southern red cedar (*Juniperus silicicola*), and the exotic Brazilian pepper (*Schinus terebinthifolius*). The overwash mangrove swamp on the north spit (Figure 16) is occupied by three species of mangroves: red (*Rhizophora mangle*), black (*Avicennia germinans*), and white (*Laguncularia racemosa*). Black and white mangroves predominate on the south spit marsh.

Invertebrate animals observed or expected (Williams 1984) to occur within these tidal marshes include fiddler crabs (*Uca* spp.), portunid crabs (*Callinectes* spp.), a palaemonid shrimp (*Palaemontes intermedius*), penaeid shrimp (*Penaeus* spp.), other crustacea, bivalve (clams, oysters) and gastropod (snails) molluscs, polychaete worms, and a variety of aquatic, semi-aquatic and arboreal insects. Many of the previously mentioned fish species may be found within marsh habitat either as transient adults or during their immature stages. Other resident fish may include sailfin molly (*Poecilia latipinna*), sheepshead minnow (*Cyprinodon variegatus*), marsh and gulf killifish (*Fundulus confluentus* and *F. grandis*), tidewater silverside (*Menidia beryllina*), fat

sleeper (*Dormitator maculatus*), and rivulus (*Rivulus marmoratus*) (Stewart and VanArman 1987). Birds likely to occur in and around tidal marshes and their mud flats include bitterns, herons, and egrets (Ardeidae), ibis (Threskiornithidae), the federally endangered wood stork (*Mycteria americana*), rails (Rallidae), the marsh wren (*Cistothorus palustris*), boat-tailed grackle (*Quiscalus major*), red-winged blackbird (*Agelaius phoeniceus*), sparrows (*Ammodramus, Passerculus*, and *Melospiza* spp.), and many shorebirds also associated with beaches and sand flats (Stevenson and Anderson 1994). Other terrestrial vertebrates include the cotton mouse, cotton rat, and other rodents; shrews (Soricidae); marsh rabbit (*Sylvilagus palustris*); opossum (*Didelphis virginiana*); raccoon; fox; and various reptiles; including the federally threatened Atlantic salt marsh snake (*Nerodia clarkii taeniata*).

Artificial Habitats

Rock Jetty

The existing rock jettys, built between 1968 and 1971, were approximately 4200 feet long and 47.5 feet wide on the north spit (Figure 17) and 2700 feet long and 60 feet wide on the south spit (Figure 18). They consisted of very large (8 to 12 ton) stones over two layers of smaller stones in the shape of a truncated pyramid, that extended about 7.5 feet above and 5.0 feet below mean low water. The original north jetty included an 1800-foot weir and an impoundment basin just to the south for accumulating littoral drift material, which was to be transported across the inlet to the south by use of a conventional pipeline dredge. The weir was closed with armor stone in 1984 due to high cost of removing shoal material from the sediment basin. A concrete walkway was built on top of the jetty sometime thereafter and partially extended over the blockaded weir. Scouring due to channel migration within the inlet has undermined the jetty foundation and caused subsidence and overwash in two locations. Nealy 80 per cent of the north jetty is contiguous with open water on both sides. Heavy sand accretion has occurred on both sides along most of the entire length of the south spit jetty. As a result, only the oceanward tip of this jetty is directly exposed to water on both sides.

Jetty rock provides a hard, irregular, and multi-dimensional substrate with numerous spaces that support many living organisms. All four types of marine algae, blue-green (Cyanophyta), green (Chlorophyta), brown (Phaeophyta) and red (Rhodophyta), collectively known as seaweeds, may occur on these jettys. Bivalves, particularly mussels (pelecypods) anchor themselves to the rock surface and crevices. Various crustacea, including amphipods, ostracods, and decapods, may be found on the jetty both above and below the water's surface. Some shorebirds use jettys for loafing as well as feeding. The landward end may also support plants as well as resident and transient vertebrate and invertebrate animals.

Spoil Uplands

Dredging of waterways has occurred in and around Ponce Inlet for over fifty years. Site visits and a review of aerial photographs and United States Geologic Survey 7.5 minute topographic map (New Smyrna Beach Quadrangle) revealed locations where disposal of dredged sediments

(spoil) occurred on land. Spoil disposal sites occur on the mangrove islands bordering the rivers and ICW, as well as on both Ponce Inlet spits. The site on the south spit is circular and covers approximately 55 acres in the middle of Smyrna Dunes County Park. Vegetation in this area is generally very sparse, and includes prickly pear (*Opuntia*), broomsedge (*Andropogon*), and the occasional sea oats (*Uniola paniculata*) (Figure 19). Two depressional wetlands have formed near the middle of the spoil field and support a more diverse vegetative community, similar to that associated with the wet, interdunal swales of backdune and stable dune areas. These areas are also likely to contain a greater diversity of animal life than the surrounding spoil upland.

A spoil deposit noted on the north spit is located on land between the two coves, the southernmost of which forms the old bed of the Halifax River. The site is roughly cylindical, covers approximately 4.5 acres, and its average height above the marsh on the south side is about six feet (Figure 20). Salt marsh and mangrove swamp border the area and also occur in two to three corridors which run transversely through the spoil uplands and total less than three acres (Figures 21 and 22). No wading bird rookeries were observed at this site. The spoil material visually resembled that found on the south spit. Grasses, shrubs, and small trees grew vigorously along the perimeter of the spoil site while the more interior portion alternated among patches of bare sand, grass-dominated patches, and woody trees and shrubs (Figure 18). Specific vegetation observed included pennywort, broomedge, coastal dropseed, foxtail (*Setaria* spp.), goldenrod (*Solidago* spp.), various composites (Asteraceae), greenbriar, nightshade (*Solanum* spp.), prickly pear, wild grape (*Vitis* spp.), saw palmetto, cabbage palm, southern red cedar, and Brazilian pepper. Animals inhabiting this area are expected to be similar to those occupying high and low salt marsh, mangrove swamp, and both transitional and stable backdunes. There was no evidence of past or present occupation by gopher tortoises.

Project Alternatives: Impacts to Fish and Wildlife Resources

No Action Alternative

According to the USACOE 1993 Reconnaissance Report, the no action alternative at Ponce Inlet would likely result in the following conditions: 1) continued erosion of the southern and western portions of the north spit leading to an eventual breakthrough to the old bed of the Halifax River, 2) continued shoaling of the Halifax River and new shoaling around the north channel and nearby cove in the vicinity of the expected breakthrough, and 3) increasing instability and slumping along the entire stretch of the north jetty due to new and continued undermining from water velocities associated with the current northerly position of the deepwater channel within the inlet's throat. Another condition likely to result from the no action alternative is further beach expansion along the north shore of the south spit due to sand accretion adjacent to the inlet throat. Continued erosion around the toe of the north jetty will narrow the gap of land between the inlet and the Atlantic Ocean and predispose the area to a breach during a catastrophic northeast storm. Under this scenario, the jetty would be isolated and unable to protect land areas north and west of it from flooding and erosion.

The most significant direct impact to natural resources from the no action alternative would be the projected loss of the remaining salt marsh and mangrove swamp habitat, and all the associated biomass, from continued advanced erosion of the north spit south of the old riverbed. The accompanying movement of sediment and nutrients into the water column is also likely to affect organisms within the benthic and sub-littoral zones. These effects, especially for the open-water fauna and flora, likely will be transitory due to the speed and range of shifting physical conditions typical of most inlets. The presence of an extensive marsh and mangrove system both north and south of the inlet would also tend to lessen the overall impacts of wetland loss. Additional shoaling in the Halifax River resulting from a breakthrough would impact the local benthos at that site. Shoaling may also reduce exchange of water and sediment from the marina basin cove, creating conditions favorable for expansion of the adjacent salt marsh and mangrove swamp. Degradation of the north jetty would expose more rock to the littoral and sub-littoral zone and provide additional shelter for fish and some crustacea as well as living surface for various algae and molluscs. Further expansion of the littoral zone adjacent to the inlet side of the south spit would likely benefit some benthic organisms, shorebirds, and nesting sea turtles. A breach behind the north jetty would remove some beach and foredune habitat and encroach on the transitional dune area. Fish, sub-littoral benthic organisms, and other tidal rock inhabitants would have new habitats to exploit.

Jetty Extension Alternative

Both the physical and numerical models of Ponce Inlet indicate that a 1000-foot extension of the south jetty would be the best of the extension proposals for improving the inlet's navigation characteristics, particularly within the entrance reach of the channel. The expected changes leading to a more centered channel include more uniform ebb and flood flow distributions at the entrance reach plus flood flow distributions just south of the seaward end of the south jetty.

These changes would reduce littoral drift and sand deposition within the inlet, particularly along the north side of the south spit. Construction of the south jetty extension could be accomplished from land or water. The Corps also proposed removing existing stone from a section of the south jetty near its original toe end for use in constructing the waterward extension. This entire area is land-locked and much of it is at least partially buried beneath shallow sands which accreted rapidly following jetty construction in 1969. Subsequent design studies indicated that this rock is not suitable for the proposed use.

Pre-construction Impacts

Activities preceding construction of the south jetty extension include sampling of bottom sediments within the proposed extension area, and filling in jetty voids (chinking) to create a level surface suitable for access by land-based equipment. The core sampling is done by a slow-moving, self-propelled drilling platform and is expected to have limited, short-term impacts on the benthos. This operation is not expected to have any adverse impacts on manatees or sea turtles. Chinking may temporarily impact portions of the littoral and sub-littoral zones. This operation likewise is not expected to have any adverse impacts on manatees, sea turtles, or the piping plover.

Construction and Post-construction Impacts

Impacts from increased boat and barge traffic expected during construction of the jetty extension include temporary displacement of fish, plankton, and some loafing and feeding shorebirds, permanent loss of some sand-bottomed, benthic habitat within the jetty footprint, and possible impacts to manatees and sea turtles. Land-based operations will impact beaches and possibly sand dunes within Smyrna Dunes County Park if equipment and vehicles must cross dunes in order to reach the jetty. Under these conditions, beach and dune animals and plants, including the federally listed sea turtles, piping plover, and southeastern beach mouse, may be affected. Further discussion of potential impacts to these species is addressed in the section on threatened and endangered species. Direct habitat impacts expected or predicted during the post-construction period include the addition of more dry and tidally-influenced, hard rock substrate; sand accretion to varying degrees along the beach upwards of a mile south of the new jetty; and loss of some shoals and extended beach along the north side of the south spit. The loss of some accreted sand on the south spit within the inlet throat may adversely affect the piping plover. The sand accretion predicted for the south beach will directly benefit other shorebirds, benthic species found within the littoral and sub-littoral zones, nesting sea turtles, and other upper beach fauna and flora. The dune habitat in this area and its associated biotic community will also benefit from the increased availability of sand necessary for the maintenance and growth of this habitat type. These overall benefits will more than offset the predicted loss of some littoral and sublittoral habitat adjacent to the south side of the inlet throat.

North Jetty Weir Re-opening Alternative

An 1800-foot weir constructed in the north jetty and an accompanying impoundment basin were designed to collect littoral drift across the jetty for transport across the inlet by a pipeline dredge.

The weir was closed in 1984 to stop the high cost of maintenance removal of shoal material believed to be crossing the weir. Following weir closure, erosion rates throughout the north spit increased dramatically between 1985-1990 over pre-closure erosion rates. Reopening of the weir was considered in the early phases of the Reconnaissance Report (USACOE 1993) and current Feasibility Study as a way to reduce erosion velocities and add drift material which would hopefully accrete along a portion of the north spit as well as accumulate in the impoundment basin for later use in beach renourishment. Further testing of this alternative using a scale physical model revealed that re-opening various weir lengths would no longer have the desired effect of reducing erosional forces impinging on the north spit. The alternative had called for the removal of up to 1000 feet of armor stone from the seaward end of the original weir and dredging to re-establish a limited impoundment basin. The work would be accomplished by either land or water-based, heavy equipment.

Pre-construction Impacts

Core sampling of bottom sediments within the impoundment basin are expected to have limited and short-term impacts on the area's benthic organisms and no adverse impacts to manatees and sea turtles. Chinking may temporarily impact portions of the littoral and sub-littoral zones. Possible impacts to federally-listed sea turtles and the piping plover are addressed in the section on threatened and endangered species.

Construction and Post-construction Impacts

Re-opening of 1000 feet of weir would require removal of 255 feet of concrete walkway atop the jetty and approximately 17,000 tons of armor stone. If walkway demolition and rock removal is a land-based operation, the work would involve transporting equipment over the beach. Part of the beach may be used as a staging area for materials. Some transient impacts to upper beach fauna and flora may occur, as well as temporary displacement of feeding and loafing shorebirds. Possible impacts to federally-listed sea turtles and the piping plover are addressed in the section on threatened and endangered species. A water-based operation may temporarily effect shorebirds, fish, plankton, and the sub-littoral benthos. Removal of the submerged rock would reduce the total amount of hard substrate available to algae and aquatic and semi-aquatic marine invertebrates. Dredging of the impoundment basin would have short-term, open water and benthic impacts. Dredged spoil used for beach renourishment may impact nesting sea turtles, crustacea and other littoral benthos, while careful deposition in already existing and permitted spoil disposal sites is likely to have only minor impacts on an already disturbed plant and animal community.

The major change expected from the weir re-opening is movement of additional sediment into the inlet from renewed littoral drift across the north jetty. Some of this sediment is expected to be deposited in the adjacent impoundment, where it may be piped or dredged to re-nourish south jetty beaches. Other sediment may be carried further into the inlet, where it will likely be involved in formation and maintenance of shoals, sand flats, and possibly accretion of remaining interior sand beaches bordering the north and south spits. The beach and dunes adjacent to the north jetty

may become narrower due to transport of sediment formerly available to re-nourish these habitats. With the exception of the dredging and artificial beach re-nourishment, the major expected change would potentially add new plant and animal habitat to the inlet. Since the greatest possible change to the north beach and dune system is likely to occur in the immediate vicinity of the north jetty, the overall impact to fauna and flora is not expected to be significant.

North Jetty Repair and Scour Apron Extension Alternative

Rebuilding slumped portions of the north jetty crest and extending the scour apron along the south side of the north jetty are considered separate maintenance projects from the main Ponce Inlet Navigation Improvement Project. These projects were included as alternatives because of their expected contribution to improving the overall inlet stability. The north jetty repair project involves placement of approximately 610 tons of armor stone in three places to raise the jetty to its original crest height. The scour apron consists of filter cloth, foundation and armor stone placed over an approximately one-half acre submerged area at the jetty's base in the vicinity of the existing scour apron. Due to the presence of a concrete boardwalk over a landward portion of the jetty, a water-based operation would be the only practical method available to accomplish both projects.

Impacts

The habitat and fish and wildlife resource impacts from these projects are expected to be about the same as those of the water-based operations for the south jetty extension alternative.

Groin Field Alternative

The construction of a set of three groins along the sand spit inside the inlet adjacent to the north jetty was originally considered to preserve the remaining shoreline and prevent breaching of the spit by deflecting flood tidal currents away from the spit. Since this alternative was considered in the 1993 Reconnaissance Report, more than 60 acres of remaining sand spit and marsh have been lost to erosion. As a result of these physical changes to the north spit, the Corps has re-reviewed this alternative and determined that the current conditions no longer matched the parameters under which the groin field was to operate. The Corps therefore decided to delete this alternative from project consideration.

Revetment Alternatives

Alignment One

The Reconnaissance Report considered the use of a hardened barrier as a permanent alternative which would provide direct protection of some wetlands and upland property adjacent to the north spit by preventing the further landward migration of its shoreline. The report discussed three alignments, all of which would originate from the toe end of the north jetty and offer varying degrees of protection. The first alignment would extend 4800 feet and offer maximum protection

from shoreline erosion, inlet breaching, and ocean flanking of the jetty by completely encircling the north spit. Most of the footprint for the first alignment, however, has been lost due to shoreline erosion of the north spit over the last four years. Based on the estimated rate of continued erosion, the remaining marsh south and west of the old Halifax riverbed will be gone before any action on a revised alignment one can be initiated. The Corps has therefore dropped this alignment from consideration as a viable alternative and an evaluation of its impacts on natural resources is no longer necessary.

Alignment Two

The second alignment would extend approximately 2300 feet to the tip of a mixed marsh and spoil upland peninsula along its southern and western borders. The peninsula is located between the marina cove and the old bed of the Halifax River. This alignment is expected to protect against jetty flanking and potential erosion of the marsh/spoil peninsula, although it offers no protection against inlet breaching. The revetment footprint would total approximately 7.12 acres. Two herbaceous spoil fields totalling 2.42 acres (Figure 23) and located in the middle and west end of the spoil peninsula are being considered for staging areas and stockpiling material and possibly equipment. The entire operation will be land-based. A review of the expected impacts from this alignment are described below.

Pre-construction Impacts

A tracked vehicle was used to transport a survey crew to delineate the midpoint of the revetment and collect soil core samples. The vehicle traversed spoil upland, mangrove swamp and high salt marsh. The wetland area covered by the vehicle was within the footprint of the proposed revetment. No permanent effects from the tracks were noted in the upland areas. Mangroves and salt marsh vegetation within the track path had not recovered two months following the survey. Some fiddler crab burrows were noted in the track path, though they were less than in the surrounding, non-impacted wetland. The area within the footprint would have to be cleared of all vegetation, creating a potential erosion condition into the old riverbed.

Construction and Post-construction Impacts

The first section of this alignment, a landward extension of the north jetty, would impact approximately 2.85 acres and traverse a portion of the existing sand barrier as well as some backdune habitat. The few plants which colonized the sand barrier were found adjacent to the backdunes and marsh. Animal use of this sand deposit is likely to be transitory. The permanent loss of the backdune habitat within this section will not be significant since the adjacent Lighthouse Point County Park consists primarily of this type of habitat.

The second section would directly impact a total of approximately 4.27 acres, including between two and three acres of tidal mud flat, low and high salt marsh, and mangrove swamp. Impacts to tidal mud flats would be temporary since sedimentation and backfill would be expected to cover at least that portion of the revetment where the impacts occur below mean low water. In-kind

mitigation would be expected for the loss of the vegetated wetlands. This habitat is also within the range of the federally threatened Atlantic salt marsh snake. Impacts to the additional 2.42 acres of open spoil fields are not likely to be significant since these areas represent artificial, disturbed habitats characterized by patches of bare sand and a flora limited to mainly one grass and a scattering of herbaceous and woody plants. The loss of the mixed herbaceous and woody transitional area also will not be significant because similar habitat on the peninsula still exists as well as more extensive habitat on the north side of the marina cove.

An indirect impact of the revetment is the possible mortality of some mangroves adjacent to the revetment due to the blocking of tidal flow between the old riverbed and the peninsula's wetlands. Depending upon rainfall and tidal influence, these areas may convert into a more herbaceous, high marsh, or become a salt barren. Any indirect loss of mangrove swamp must be included when considering possible mitigation for direct impacts.

Few upland or transitional plants and terrestrial animals are likely to use the dry portions of the revetment. Estuarine organisms may use those sections of the revetment that are under regular and irregular tidal influence. In the event the remaining north spit marsh erodes and inlet breakthrough occurs, a portion of the entire southwest side of the revetment is predicted to be under littoral and sublittoral influence. The pattern of floral and faunal use of this area is then expected to be more like that of the north and south jettys.

Alignment Three

The third revetment alignment would extend 1600 feet from the north jetty towards the marina along open water, wetlands, and dense transitional uplands which form the northwest boundary of the marina cove. The revetment footprint would total about 4.86 acres and would only protect against ocean flanking of the north jetty.

Pre-construction Impacts

A paved road is adjacent and parallel to the alignment's footprint. This road and the lack of unpaved roads through the transitional area eliminates the need and potential habitat impacts from collecting soil core samples with a tracked vehicle. The area within the footprint would have to be cleared of all vegetation, creating a potential erosion condition into the marina cove.

Construction and Post-construction Impacts

This alignment would directly impact 4.86 acres, 2.85 acres of which traverse a portion of the existing sand barrier as well as some backdune habitat. These sites are the same as those described for section one of the revetment two alignment, with similar expected impacts. The remaining two acres are predominantly transitional uplands plus some tidal mud flat, salt marsh, and mangrove swamp. The impact to tidal mud flats would be temporary, since sedimentation and backfill would be expected to cover at least that portion of the revetment where the impact occurs below mean low water. In-kind mitigation would be expected for the loss of the vegetated

wetlands. The loss of the mostly woody transitional area would be significant since the only other habitat within the north spit area is on the spoil peninsula, where there are concerns about erosion following a breakthrough produced by a catastrophic weather event.

Channel Dredging Alternative

This alternative consists of engineering a channel through the old riverbed to provide a more northern link between Ponce Inlet and the north channel of the Halifax River. The dredged channel would be approximately 2500 feet long, 100-200 feet wide, with an operating of depth of 12 feet. Creation of a controlled channel would not protect the remaining north spit marsh or toe end of the north jetty from erosion, nor would it necessarily by itself protect the north jetty from flanking. The benefit would be to protect the spoil peninsula from erosion and maintain navigability by reducing shoaling potential at the mouth of the marina cove and the adjacent Halifax River. The dredging would likely require both land and water-based operations.

Pre-construction Impacts

Samplings of submerged sediment within the proposed dredge area by barge and small boat are expected to have only temporary effects on the benthos. Impacts similar to what occurred with revetment alignment two may be expected if soil sampling of the two to three acres of salt marsh and mangrove swamp within the channel footprint is done using a tracked vehicle.

Construction and Post-construction Impacts

The dredging in open water will remove the existing benthic community within the excavated area. Turbidity, especially within the old riverbed, will likely have a temporary, though possibly significant impact, on plankton and fish. Dredging within the inlet mouth may temporarily increase the risk of impacts to manatees and sea turtles. Land-based operations will remove some terrestrial plants and temporarily displace or kill some animals, possibly including the Atlantic salt marsh snake. Up to three acres of mixed salt marsh, mangrove swamp, and sand beach will be lost due to their location within the footprint of the channel. In-kind mitigation would be expected for the loss of the vegetated wetlands. Dredging would generate approximately one million cubic yards of spoil. Beach-quality material may be used in re-nourishment projects, subject to further review by state and federal agencies. Other spoil should be deposited within permitted and active disposal sites to minimize potential impacts to fish and wildlife resources. Permitted but inactive sites and new sites without wetlands under consideration for disposal should first be assessed for occurrence of and potential impacts to federally listed species. New potential sites with possible wetland impacts would first require a review of all fish and wildlife resources for possible impacts.

Some recolonization of dredged areas within the vicinity of the inlet and Halifax River should occur, and produce a benthic structure similar to the existing community. Significant changes in depth, current, salinity, and bottom sediments are expected within the old riverbed following dredging. These changes are expected to favor a biotic community which will more closely

resemble that occurring within the inlet and Halifax River. If this alternative produces greatly reduced water velocities on the flood tide in the vicinity of the spoil disposal peninsula, some accretion and low and high marsh formation may occur on the peninsula's southwest shore. If landward water velocities are not significantly diminished over current conditions, some erosion, possible significant, may occur along the same shoreline. This would likely have short-term impacts on the open water and benthic communities.

Alternatives and Mitigation Recommendations

Alternatives Analysis and Recommendations

In order to evaluate and recommend one or more navigation improvement alternatives, the Service first separated them into three broad, subjective categories based on their net average potential impact to fish and wildlife resources. The alternatives were then further ranked within categories based upon a direct comparison of the number and type (beneficial/harmful), size (large/medium/small) and duration (long/short) of individual impacts. Both classifications follow a descending order from potentially best to worst case situations for natural resources.

Category 1 (Alternatives Which Potentially Have a Net Beneficial Impact)

- no action alternative
- water-based construction of a south jetty extension

Category 2 (Alternatives Which Potentially Have No Net Impact)

- construction of an additional north jetty scour apron and a rebuilding of the damaged portion of the north jetty
- water-based re-opening of a portion of the north jetty weir

Category 3 (Alternatives Which Potentially Have At Least A Minimum Net Harmful Impact)

- construction of either revetment alignment
- land-based re-opening of a portion of the north jetty weir
- land-based construction of the south jetty extension
- engineering a new Federal channel through the old Halifax riverbed

The no action alternative was included for comparative purposes only. The separation of land from water-based operations was important because either operation may be logistically suitable for certain alternatives and because of the potential added harmful impacts to beach and dune habitats from land-based activities. According to the analysis, this distinction is most notable with the south jetty construction alternative.

Both the physical and mathematical models of Ponce Inlet indicate that a 1000-foot extension to the south jetty is the best alternative for centering the existing channel at the inlet mouth, which currently impinges on a large portion of the north jetty. This alternative is also expected to reverse the shoaling and buildup of sand flats within the inlet along the northern border of the south spit. This sand will instead be deposited in the nearshore zone within a mile south of the jetty and ultimately add to the beach width and sand dune maintenance. Combined with our analysis, the Service can recommend the water-based operation as the preferred alternative. Measures and conditions associated with this endorsement involve threatened and endangered species and are included in that section of this report. The Service recognizes that although we do not recommend a land-based operation, circumstances may require that this alternative be implemented. We therefore also reviewed this alternative and provided additional measures and

conditions as appropriate to minimize adverse impacts. Possible nighttime work was reviewed and additional measures and conditions provided to account for impacts from this activity.

The Service considered the north jetty repair and scour apron construction to occur only as a water-based operation due to the location of the required work and the presence of the county concrete walkway. As such, the analysis rated this alternative as essentially neutral with respect to natural resource impacts and worth a Service recommendation. Again, the Corps should refer to the section on listed species for the appropriate measures and conditions pertinent to this alternative.

Although the mathematical model initially endorsed the reopening of the north jetty weir as an improvement to navigation, further analysis and the physical model revealed that this alternative would not fulfill its desired role of centering the current channel through the inlet throat nor removing the erosive pressures in this area along the north spit. Since this alternative presently does not appear viable, the Service finds that a specific recommendation on this alternative at this time would not be appropriate. In general, however, the Corps may consider other modifications of this proposal, as long as the Service determines that these modifications maintain or improve the original ranking of the water-based operation with respect to natural resource impacts.

The remaining alternatives were proposed to control erosion of the north spit. The Service believes the second hardened revetment alignment is preferred over alignment three or a new channel. The most significant impact involves loss of jurisdictional wetlands which may result in direct kill of federally threatened Atlantic salt marsh snake and adversely affect its continued existence through habitat loss. Specific measures and conditions addressing this snake may be found in the endangered species section. Analysis, discussion, and recommendations regarding wetlands loss and mitigation are addressed separately in the following subsection.

Wetland Mitigation Analysis

The second and third revetment alignment alternatives will directly and indirectly impact up to four acres of wetlands on the north spit. The creation of a new Federal channel through the old Halifax riverbed is expected to impact an additional three acres in this area. The Corps believes that failure to implement one or more of these alternatives will result not only in the loss of the above wetlands but all remaining salt marsh and mangrove swamp east and south of the existing marina. This prediction on the future extent of north spit erosion results from extrapolation of previously determined erosion rates and an understanding of the general hydrodynamic forces operating at inlets. A review of maps depicting the historical conditions at Ponce Inlet since the beginning of the 17th century (Taylor 1993, Davies 1995) also demonstrates the tendency of the inlet to form parallel shorelines within its throat and have mouths that are at least as wide as the throat. The available information thus strongly suggests that the current erosive pressure on the north spit will likely continue until its shoreline within the throat is aligned in a more nearly parallel direction with the north jetty.

Recommendations

As a result of the above analysis, the Corps' position (Appendix I) is that mitigation should not be required since the proposed alternatives will actually result in a net savings of approximately 4.5 acres of mixed wetlands on the north spit north of the spoil upland. The Corps also agreed to consider some measure of environmental benefits associated with these alternatives provided they are achievable at little or no additional cost. Although the Service accepts the previous interpretation of possible future conditions at the inlet without intervention, no predictions were made regarding the composition of the north spit shoreline waterward of the revetment or landward of the engineered channel. While specific mitigation requirements may not be appropriate, the Service believes the Corps as a minimum should make every effort to maintain the current tidal flat, fringing salt marsh, and mangrove swamp located between the old Halifax riverbed and the adjacent spoil upland. We therefore recommend that the Corps observe the following conditions to the maximum extent practicable.

- Align the channel and/or revetments to reduce their direct or indirect impacts on the preceding jurisdictional wetlands.

- Where wetland impacts are unavoidable, dredge and fill operations should be conducted in a manner that restores the existing grade and dimensions of those wetlands prior to completion of the projects. This strategy will promote natural reestablishment of the biota associated with the tidal flat, salt marsh, and mangrove swamp.

-Artificially plant the dominant salt marsh and mangrove flora on the appropriate impacted areas at low densities to initially stabilize all areas and provide starter stock for those areas that are furthest from contiguous natural vegetation and less likely to be adequately vegetated through natural reestablishment.

Endangered Species Act

Consultation History

On December 11, 1992, the U.S. Fish and Wildlife Service (Service) provided the U.S. Army Corps of Engineers, Jacksonville District (Corps), with information covering issues and concerns pertinent to proposed navigation improvements to Ponce de Leon Inlet, Volusia County, Florida. On June 27, 1996, the Service received a biological assessment prepared by the Corps for the Ponce de Leon Inlet Navigation Study. The Corps identified six species as possibly occurring within the study area: the West Indian manatee (*Trichechus manatus latirostris*), Atlantic salt marsh snake (*Nerodia clarkii taeniata*), loggerhead sea turtle (*Caretta caretta*), bald eagle (*Haliaeetus leucocephalus*), piping plover (*Charadrius melodus*), and wood stork (*Mycteria americana*). The study area does not encompass any designated critical habitat. The Corps, after proposing measures to protect manatees and sea turtles from possible impacts, determined that the potential project activities will not adversely affect these, the other listed species, or critical habitat.

After reviewing the assessment and other information, the Service concurs with the Corps' evaluation on the bald eagle, wood stork, and West Indian manatee. With respect to manatees, we would further recommend that the Corps first attempt to restrict any water-based activities to the months of November through February. Regarding the piping plover, Atlantic salt marsh snake, and the loggerhead, green (*Chelonia mydas*), Kemp's ridley (*Lepidochelys kempii*) and leatherback (*Dermochelys coriacea*) sea turtles, we believe some of the potential actions may adversely affect these species. We also believe possible dune impacts on the southern spit may affect the federally threatened Southeastern beach mouse (*Peromyscus polionotus niveiventris*). The Service initiated formal consultation in our letter of June 20, 1996. The following section represents the Service's biological opinion on the effects of certain project activities on the Atlantic salt marsh snake, piping plover, four species of sea turtles, and the southeastern beach mouse, in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act)(16 U.S.C. 1531 *et seq.*).

This biological opinion is based on field investigations, Service data, the Volusia County draft beach habitat conservation plan and its environmental assessment, conversations with Mr. Paul Moler, Florida Game and Fresh Water Fish Commission, and Ms. Sandy MacPherson, the Service's southeastern turtle coordinator, and other sources of information. A complete administrative record of this consultation is on file in the Service's Jacksonville Field Office.

Description of Proposed Actions

The Corps has proposed several measures to control erosion and shoaling in and around Ponce Inlet and realign the existing navigation channel within its mouth and throat. Three of these alternatives may affect threatened and endangered species and include:

constructing a 1000-foot seaward extension to the existing south spit jetty,
-constructing a 2300-foot rock revetment extending from the toe end of the north spit jetty south and west along the border of a mixed marsh and spoil upland peninsula located between two coves, and
-creating a new 2500-foot Federal navigation channel connecting the inlet with the existing Halifax River channel through the old bed of the Halifax River.

The Corps will construct the jetty extension either from a barge or the jetty. A land-based operation will require transport of materials, equipment, and labor across some portion of the south barrier island beach. Portions of beach adjacent to the south jetty and above mean high water also may be used as both a staging area for construction equipment and supplies and temporary parking of project vehicles. Construction of the rock revetment will require filling approximately 2-3 acres of wetland, while the new channel will remove up to three acres of wetlands and sand beach. No specific mitigation is required for these impacts, since the Corps believes controlled channelization or a hardened revetment will prevent erosion north of those sites and result in a net savings of 4.5 acres of intertidal wetlands. Careful excavation and grading waterward of the revetment and placement of extra fill in open water near the revetment, however, may result in the establishment of additional wetland areas.

Status of the Species

Atlantic salt marsh snake - The subspecies was listed as threatened on November 29, 1977. Its historic distribution is restricted to Volusia and Brevard Counties and northern Indian River County, Florida. Intergrades with the mangrove salt marsh snake (*Nerodia clarkii compressicauda*) are known south of Volusia County, its core area (Kochman and Christman 1992). The snake inhabits coastal mangrove swamps and salt marshes, where it occurs along saltgrass-bordered tidal creeks, ditches, pools, and saltwort flats often in association with fiddler crab burrows (USFWS 1993). Individuals are also likely to use adjacent wetlands that are unoccupied by other water snakes (P. Moler, Florida Game and Fresh Water Fish Commission, personal communication). This species is most active at night during periods of low tides, when it feeds on small fish concentrated by the shallow water.

The major threat to this species in its core area is habitat loss, while habitat fragmentation north, east and south may increase the level of hybridization with congeners and conspecifics, resulting in a potential swamping of the Atlantic salt marsh snake gene pool (Kochman and Christman 1992). Habitat impacts are primarily the result of filling, draining, diking, and impounding areas for human development.

Piping plover - The Atlantic coast population of this species was listed as threatened on January 10, 1986. These birds breed from the Canadian maritime provinces through North Carolina, and winter primarily along the southeastern Atlantic coast from North Carolina through Florida. Several sightings have been recorded in the Carribean. Wintering plovers on the Atlantic coast in general occur at accreting ends of barrier islands, along sandy peninsulas, and near coastal inlets. They appear to prefer sandflats adjacent to inlets or passess, sandy mudflats along prograding spits, and overwash areas as foraging habitats. They seem to exhibit a relatively high degree of winter site fidelity, and birds within the action area have repeatedly been observed over the years at Smyrna Dunes County Park (Hecht et al. 1996).

Major threats to the wintering population include habitat loss or degradation from inlet and shoreline stabilization, inlet dredging, beach maintenance and nourishment, and late season hurricanes and other winter storms.

Sea turtles - The leatherback and Kemp's ridley sea turtles were listed as endangered on June 2 and December 2, 1970, respectively. The Florida population of green turtles, and loggerhead sea turtles were listed as endangered and threatened, respectively, on July 28, 1978. The U.S. Fish and Wildlife Service has responsibility for regulating sea turtles when they come ashore to nest. The National Marine Fisheries Service has jurisdiction over sea turtles in estuarine and marine environments.

Adult Kemp's ridley occur primarily within the Gulf of Mexico while subadult turtles range widely throughout the Gulf as well as in the North Atlantic from Florida northward to Nova Scotia and eastward to Bermuda, the Azores, and Europe (Ogren 1992). This species is usually associated with benthic habitats having sand or mud bottoms, where they feed on crabs, molluscs, and other bottom-dwelling species. Breeding and nesting occur annually in April through August on sandy beaches during broad daylight (Volusia County Draft Beach Habitat Conservation Plan 1996). All but a few gravid females nest on selected Mexican beaches in synchronized aggregates. In the United States a few individual turtles have nested in south Texas, and five confirmed nests have been recorded in Florida; two in Pinellas County in 1989 and 1994, two in Volusia County in 1996 adjacent to Ponce Inlet (M. Sole, Florida Department of Environmental Protection, pers. comm.), and one on Sanibel Island in Lee County in 1996 (S. MacPherson, U.S. Fish and Wildlife Service, pers. comm.). In 1992, two Kemp's ridley nests were documented in South Carolina and North Carolina. In addition, in 1989, four false crawls were documented from Palm Beach County.

The decline of the Kemp's ridley sea turtle is thought to be primarily due to the collecting of eggs and taking of females for food, and shrimp trawl mortality on the foraging grounds.

The leatherback sea turtle ranges widely from tropical through sub-polar waters of the Atlantic, Pacific and Indian Oceans (Pritchard 1992). Its diet consists mainly of jellyfish taken in open waters. Nesting grounds are distributed circumtropically, with the Pacific Coast of Mexico supporting the world's largest known concentration of nesting leatherbacks (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1992, National Resource Council 1990). In Florida, nesting occurs on both coasts at night, with most located on the east coast within the mid-peninsula, particularly on Hutchinson Island in St. Lucie and Martin Counties (Meylan et al. 1995). The season begins and ends earlier than most other sea turtle species, with the earliest recorded nesting in Volusia County on April 29 and the latest on June 26 (Florida Department of Environmental Protection 1995). Individuals nest an average of five to seven times a year (Tucker 1989a, Tucker and Frazer 1991).

The worldwide population of breeding leatherback females has been estimated at 136,000 (Pritchard 1992). Although some Atlantic turtle rookeries may be experiencing some nesting increases, stresses remain on many others, including excessive egg collecting in Central America, slaughter of nesting females in Guyana and the Antilles, and habitat modification and loss in Florida.

Green sea turtles are distributed worldwide throughout the tropics and subtropics. The species is herbivorous in all its life stages. The largest breeding population in the U.S. occurs on the east coast of Florida, particularly in Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward Counties (National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991a). Allard et al. (1994) concluded that this population is genetically distinct, and Meylan et al. (1995) believed the Florida aggregation deserves recognition as a regionally significant colony. Nesting on Florida beaches occurs from May to September, with individuals nesting as many as six times in a season (Ehrhart and Witherington 1992). Females return to the same stretch of beach at predominately two-year intervals.

Observations over the last two decades suggest a consistent trend towards increased green turtle nesting with probably no more than 375 adult females nesting in Florida at the beginning of this decade (Ehrhart and Witherington 1992). Continued threats to this nesting population include habitat loss and modification, other human disturbance, storm-induced beach erosion, predation of hatchlings, and hatchling mortality and adult nesting inhibition due to disorientation from coastal lighting.

The loggerhead sea turtle is global in distribution, inhabiting the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. Its diet consists of various invertebrates, including molluscs, crustaceans, and horseshoe crabs (Dodd 1992). Nesting within the continental United States occurs from Virginia to Louisiana. The southeastern aggregation (North Carolina through the Florida panhandle) is globally significant since it is second in size only to the aggregation on islands in the Arabian Sea off Oman (Ross 1982,

Ehrhart 1989, National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b). Recent genetic analyses (Bowen et al. 1993, B.W. Bowen, University of Florida, Gainesville, in litt., November 17, 1994, and October 26, 1995) revealed this aggregate to consist of three distinct populations. Approximately 80 percent of loggerhead nesting in the southeastern U.S. occurs in six Florida counties (Brevard, Indian River, St. Lucie, Martin, Palm Beach, and Broward). Nesting in Florida occurs from late April through September, with most females nesting between two and six times during the season within the same general area (Dodd 1988, 1992).

While the number of reported sea turtle nests in Florida has increased since 1979, this trend closely parallels increases in the level of survey effort. To obtain more precise and accurate nesting assessments, the State of Florida, in cooperation with the Fish and Wildlife Service, initiated an Index Nesting Beach Survey (INBS) program in 1989 to scientifically collect and statistically analyze nesting data. The Florida INBS monitoring occurs on 27 beaches, which comprise an average of 80 percent of the reported annual statewide nesting activity of loggerhead and green sea turtles. To date, results of this program have shown small fluctuations in the annual number of loggerhead nests. Continued threats to the Florida nesting population include habitat loss and modification, other human disturbance, storm-induced beach erosion, predation of hatchlings, and hatchling mortality and adult nesting inhibition due to disorientation from coastal lighting.

Southeastern beach mouse - This subspecies of oldfield mouse was listed as threatened on May 12, 1989. Its historic distribution included the southeastern Florida coast from Hollywood Beach in Broward County north to Ponce de Leon Inlet in Volusia County. Local populations currently are distributed from Ft. Pierce Inlet Recreation Area in St. Lucie County to Canaveral National Seashore in Brevard County. Principal habitat includes vegetated coastal foredunes, with mice in some locations also found within the grassy/shrub area of backdunes and the woody scrub area associated with stable dunes (Stout 1992).

Major threats to the species include habitat loss, degradation, and fragmentation resulting from development and catastrophic weather events, predation from feral cats, and competion with other rodents.

Environmental Baseline

Action Area

The action area for this biological opinion is defined as the area within an approximate 1.12-mile radius of the waterward end of the south jetty located at the northeast corner of Smyrna Dunes County Park in S32, T16S, R34E. The action area also includes additional beach habitat up to 1.5 miles south of the south jetty. Naturally-occurring systems within the area include open water (sub-littoral zone) and benthos associated with the Atlantic Ocean, inlet mouth and throat, the Indian and Halifax Rivers, and north spit coves; sand beach, tidal flats (littoral zone), high and low salt marsh, and mangrove swamp. Altered habitats include spoil uplands on both north and south

spits; two rock jettys; and a beach-quality, sand barrier on the north spit. The entire action area lies within the Ponce de Leon conservation unit, identified as P08 in the Coastal Barrier Resources System, and designated under the Federal Coastal Barrier Resources Act of 1982, as amended. In addition, tidal marsh within the action area has been identified as part of a strategic habitat conservation area for the Atlantic salt marsh snake (Cox et al. 1994).

Status of Species in the Action Area

Atlantic salt marsh snake - A survey of the area within the last five years (G. Goode, Volusia County Mosquito District, personal communication) failed to locate any snakes. There are occurrence records for the species, however, on the barrier islands just north and south of the inlet and on the mainland west of the inlet (Cox et al. 1994; P. Moler, pers. comm.).

Piping plover - Smyrna Dunes County Park is one of only six known wintering locations on the southeast Florida coast (Hecht et al. 1996). Results of the annual winter census at Ponce Inlet typically produce a count of from one to ten birds, with three to six birds observed there in January 1996 (L. Karolee Owens, U.S. Fish and Wildlife Service, pers. comm.). These birds occurred on the sand beach and flats between the south jetty and Coast Guard Station on the north Indian River.

Sea turtles - Strandings of the four sea turtle species are known to occur on Volusia County beaches. Nesting of the Kemp's ridley was recently documented (May 1996) for the first time in Volusia County on the barrier island just north of the action area (M. Sole, pers. comm.). Only seven leatherback nests have been recorded from Volusia County beaches between 1988 and 1994 (Meylan et al. 1995, FDEP 1995). Five of the seven nests occurred on a beach segment which encompasses Ponce Inlet. Because leatherbacks can begin nesting in mid-April and systematic nesting surveys do not begin until late April or early May, some nesting events may be overlooked (Meylan et al. 1995). Green turtles nested a total of 319 times during the above seven year period, with nearly 90 percent of that occurring within Canaveral National Seashore. Nesting dates ranged from May 18 to September 28. The total represents approximately three percent of all green turtle nesting in Florida. Loggerheads are by far the most abundant of the nesting sea turtles in Volusia County, with 11,601 nests recorded between 1988 and 1994. About 20 percent of those nests occurred within the 35 mile stretch of county beaches, which encompasses Ponce Inlet. The nesting period runs from April 18 to mid-September. Loggerheads found in Volusia County represent the southernmost limit of the northern nesting population, which runs from Hatteras, North Carolina, to Cape Canaveral, Florida.

Since gene flow among this and the South Florida and Panhandle populations is very low, impacts on loggerheads in the northern nesting population, in particular, become more significant because of the smaller total population, as well as observed population declines in Georgia and South Carolina (Frazer 1983, 1986; J. Richardson, pers. comm. cited in Dodd and Byles 1991; National Marine Fisheries Service and U.S. Fish and Wildlife Service 1991b).

Site specific nesting information for Ponce de Leon Inlet from 1992-1995 revealed a cluster of eight nests approximately one-half mile north of the north jetty and within 800 feet of the Beach Street access ramp. A total of 65 nests were located within the action area south of the inlet, with only three occurring north of the south jetty within the inlet (Volusia Sea Turtle Society, unpublished data).

Southeastern beach mouse - Habitat at Smyrna Dunes Park appears suitable for supporting a population of beach mice. Burrows similar to those excavated by beach mice were observed on the back slope of existing foredunes. According to J. Stout (University of Central Florida, pers. comm.) this area has not been surveyed in the last twenty years.

Effects of the Proposed Actions

Atlantic salt marsh snake - Wetland activities (i.e., dredging and filling) associated with construction of either the rock revetment or engineered channel may kill or injure individual snakes. Each of the proposed alternatives will impact up to 3 acres of intertidal wetlands. The Corps believes that without controlled channelization or a hardened revetment, current erosion rates coupled with storm surges could eliminate all the remaining salt marsh and mangrove swamp along the north spit. Based on the small ratio of impacted (3 acres) to estimated (11,700 acres) snake habitat rangewide (Cox et al. 1994), the proximity of remaining salt marsh and mangrove swamp north of the impact area, and the observation that the potential impact area is not optimum salt marsh snake habitat (G. Goode, Volusia County Mosquito Control District, personal communication), the Service feels the overall impact to the Atlantic salt marsh snake will be minimal.

Piping plover - Land-based operations associated with the south jetty extension alternative occurring from October through March may disturb and temporarily displace foraging birds. This is more likely to take place north and west of the south jetty within the beach and flat area adjacent to the inlet throat. The expected loss of some shoals and sand flats in this area as a result of the jetty extension will likely reduce the overall foraging habitat for wintering birds. Since the jetty extension is not expected to impact all the beach or flats between the jetty and the Coast Guard station, and extensive sand flats occur nearby in both the Halifax and north Indian Rivers, the Service believes the overall impact to the overwintering, Atlantic coast population of piping plovers will be minimal.

Sea turtles - Land-based operations on the south jetty during turtle nesting and hatching seasons can disrupt adult nesting activity as well as expose adults, hatchlings, and eggs to mortality from vehicles. Sand compaction may contribute to adverse effects on nest site selection and digging behavior (Nelson and Dickerson 1987, 1988c; Nelson 1988). Severe compaction has been shown to significantly increase the number of false crawls, thereby reducing nesting success (Fletemeyer 1980, Raymond 1984, Nelson and Dickerson 1987, Nelson et al. 1987, Nelson and Dickerson 1988a,c). The storage of vehicles, equipment and materials on the beach can create barriers to nesting females emerging from the surf, resulting again in a higher incidence of false crawls and unnecessary energy expenditure. Vehicles and equipment can also create sand ruts which may

trap, misdirect, and otherwise detain hatchlings. Driving may also crush nests, as well as adults and hatchlings if it occurs after dark. These impacts may extend as far south as the closest public beach access, Beachway Avenue, approximately 1.5 miles from the south jetty.

Vehicle and other operational lights can also impact sea turtles. Artificial beachfront lighting has caused disorientation (loss of bearings) and misorientation (incorrect orientation) of hatchlings (Philbosian 1976; Mann 1977; Florida Department of Environmental Protection, unpubl. data). Reduction in nesting activity has been documented for beaches illuminated with artificial lights (Witherington 1992). Construction related lights therefore may deter females from coming ashore to nest, disorient females trying to return to the surf after a nesting event, and disorient and misorient emergent hatchlings from adjacent non-project beaches. Any source of bright lighting can profoundly affect the orientation of hatchlings, both during the crawl from the beach to the ocean and once they begin swimming offshore. Hatchlings attracted to light sources on construction barges may not only suffer from interference in migration, but may also experience higher probabilities of predation to predatory fishes that are also attracted to the barge lights. This impact could be reduced by using the minimum amount of light necessary, which may require shielding or low pressure sodium lighting during project construction.

Impacts from land-based operations can be reduced by continued implementation and enforcement of the Beach Code portion of the Volusia County Beach Management Plan and county lighting ordinance during the nesting and hatching season each year.

Based on the small ratio of potentially impacted (1.5 linear miles) habitat to existing county habitat (49.08 linear miles), the extent of these species' ranges elsewhere, and the current and future beach driving and lighting requirements, described within an existing county beach management plan and draft beach habitat conservation plan, the Service believes the overall impact to the four species of sea turtles will be minimal.

Southeastern beach mouse - Land-based operations for the south jetty construction alternative may impact beach mouse habitat if jetty access occurs through the service road and dunes within Smyrna Dunes Park. Excavation of occupied habitat will cause displacement and possible mortality of mice. The Service expects that any impacts will be temporary and not significant since the area affected is expected to be small relative to the available habitat within the park and elsewhere within the species' range.

Cumulative Effects

Cumulative effects include the effects of future state, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. The Service is not aware of any cumulative effects in the project area.

Conclusion

After reviewing the current status of the Atlantic salt marsh snake, piping plover, Kemp's ridley, leatherback, green, and loggerhead sea turtles, southeastern beach mouse, the environmental baseline for the action area, the effects of the proposed navigation improvements, and the cumulative effects, it is the Service's biological opinion that the Ponce de Leon Inlet navigation improvement project, as proposed, is not likely to jeopardize the continued existence of the Atlantic salt marsh snake, piping plover, southeastern beach mouse, nor the four, above-named species of sea turtles. No critical habitat has been designated in this area for the Atlantic salt marsh snake and Kemp's ridley, green, and loggerhead sea turtles; therefore, none will be affected. Marine and terrestrial critical habitat for the leatherback has been designated at St. Croix, U.S. Virgin Islands; however, this project does not affect locations outside the action area, and no destruction or adverse modification of that critical habitat is anticipated.

Incidental Take

Sections 4(d) and 9 of the ESA, as amended, prohibit taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct) of listed species of fish or wildlife without a special exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is any take of listed animal species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary, and must be implemented by the agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The U.S. Army Corps of Engineers has a continuing responsibility to regulate the activity covered by this incidental take statement. If the Corps fails to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, or fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

The Service has reviewed the biological information and other information relevant to the Ponce de Leon Navigation Project. Based on this review, incidental take is anticipated for Atlantic salt marsh snakes, sea turtle adults and hatchlings during the nesting and hatching seasons, and the southeastern beach mouse. Direct and indirect impacts to all snakes are expected from the filling of salt marsh and mangrove swamp on the north spit associated with the proposed revetment construction alternative, and dredging of similarly located habitat for the proposed creation of a

new channel through the old bed of the Halifax River. Direct impacts to all sea turtle hatchlings and adults within a mile of the south jetty are expected from lighted nighttime construction activities there. Further direct impacts to all hatchlings and adults are expected from nighttime collisions with vehicles and motorized equipment between Beachway Avenue to just north of the south jetty. Another direct impact expected with this alternative is site-specific mortality of all beach mice from possible dune excavation. Indirect impacts from a land-based operation at the south jetty may be entrapment of up to 1600 hatchlings within sand ruts, impairment of up to six nesting females resulting from beach storage of vehicles, equipment, and materials, and temporary loss of beach mouse dune habitat due to possible excavation for jetty access.

Effect of the take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and prudent measures

When providing an incidental take statement, the Service is required to give reasonable and prudent measures it considers necessary or appropriate to minimize the take, along with terms and conditions required to implement those measures. The Service also must include specific procedures for handling or disposing of any individuals taken. The following are the reasonable and prudent measures the Service believes are necessary and appropriate to minimize take of the Atlantic salt marsh snake, Kemp's ridley, leatherback, green, and loggerhead sea turtles, and southeastern beach mouse.

Atlantic salt marsh snake

The Corps will insure that every reasonable effort is made to remove and allow for movement of Atlantic salt marsh snake from its habitat immediately prior to and throughout construction of the north spit revetment and new engineered channel alternatives.

Sea turtles

1. Every reasonable effort shall be made to insure that type, intensity, direction, and focus of required lighting associated with south jetty nighttime construction activities are adjusted to prevent disruption of adult nesting and hatchling behavior. All non-essential lighting shall be eliminated.

2. Movement of land-based vehicles and equipment on the beach are conducted in a manner which avoids collisions with sea turtle adults, nests, and hatchlings.

3. Nest surveys by a trained, experienced, and permitted individual will be required for any land-based operations. This individual, who should have field experience with turtle hatchling response to lights, shall also be present during nighttime construction activities to reduce impacts to hatchlings from artificial lights and sand ruts.

4. Any storage of materials, equipment, and vehicles on the beach shall be in a manner which will not impair movement of sea turtles to the maximum extent practicable.

5. The Corps shall insure that contractors involved in the proposed work fully understand the sea turtle protection measures detailed in this incidental take statement.

Southeastern beach mouse

The Corps will insure that every reasonable effort is made to minimize the extent of dune excavation and restore the affected dune ecosystem to its original condition beginning immediately after the construction access requirements are completed.

Terms and conditions

In order to implement the above reasonable and prudent measures and be exempt from the prohibitions of section 9 of the ESA, the Service is providing the Corps with the following terms and conditions for incidental take. According to the Interagency Cooperation Regulation (50 CFR 402.14), these terms and conditions are non-discretionary.

Atlantic salt marsh snake

1. A biologist familiar with the life history and ecology of the Atlantic salt marsh snake and capable of identifying, capturing, and handling this species, shall survey the habitat, at appropriate times, 24 hours prior to impact. An accurate record of snakes observed shall be kept, and reasonable efforts made to capture observed specimens. Lengths and weights of captured individuals will be taken at that time and the snake(s) released into adjacent, non-impacted habitat. The biologist must possess the proper collection permits from the Florida Game and Fresh Water Fish Commission (GFC) before preceding with this work.

2. The Corps shall provide information on this species to personnel working at the proposed alternatives sites, including a photograph of the snake for easy identification. If a snake is observed, the work shall cease until the animal has moved or is moved out of the immediate impact area.

3. If an Atlantic salt marsh snake is killed, the specimen should be collected and frozen as soon as possible. All incidental mortalities must be recorded and the U.S. Fish and Wildlife Service in Jacksonville (904-232-2580) notified within 24 hours of each event. The GFC permit should provide further information on the final disposition of the carcass, including proper handling, storage, and any transfer of specimens, if required.

Sea turtles

1. From April 15 through November 30, all on-beach lighting associated with the south jetty alternative shall be limited to the immediate area of active construction only. Such lighting shall be shielded, low wattage, low pressure sodium vapor lights to minimize illumination of the nesting beach and nearshore waters. Red filters should be placed over vehicle and equipment headlights (i.e., trucks, bulldozers, loaders). Lighting on boats, barges, and their water-borne equipment shall be similarly minimized through reduction, shielding, lowering, and appropriate placement of lights to avoid excessive illumination of the work area, while meeting all U.S. Coast Guard and OSHA requirements. Shielded, low wattage, low pressure sodium vapor lights are highly recommended where lights on watercraft and water-borne equipment cannot be eliminated.

2. Nest surveys shall be required where land-based operations for the south jetty alternative impact beaches anytime from April 15 through November 30. Surveys shall be initiated 65 days prior to jetty construction or by April 15, whichever is later, and continue through the end of the project or September 30, whichever is earlier. Only personnel with prior training and experience in nest surveying and hatchling behavior, and possessing the applicable Florida Department of Environmental Protection permit shall engage in this activity. Surveys shall be performed daily between sunrise and 9 a.m. and in such a manner so as to ensure that construction activity does not occur in any location prior to completion of the necessary sea turtle protection measures.

3. Nests located between Beachway Avenue and the south jetty will be clearly marked by a stake and survey tape or string forming a circle with a radius of 10 feet centered at the clutch. No construction-related vehicles, equipment, or supplies shall enter this circle and no adjacent construction will be allowed which might directly or indirectly disturb the area within the staked circle(s).

4. Driving of vehicles and equipment on the beach shall be restricted, to the maximum extent practicable, to the hours between sunrise and sunset from April 15 through November 30. Unavoidable nighttime beach driving shall proceed within the designated beach right-of-way at less than the posted speed. Drivers shall be alert to the possible encounter with nesting adults and turtle hatchlings and will cease movement if turtles are detected in their vicinity. Driving may

resume only after the proximal turtle activity, i.e., adult nesting or hatchling migration to the water, is completed.

5. A marine turtle permit holder shall be present during unavoidable nighttime work which overlaps potential nest hatching events, as determined by the species, nesting dates, and range of incubation times. The permit holder shall continuously observe the section of beach described in section 3 for hatchlings emerging within the immediate project area, those entrapped in sand ruts, or misdirected due to project lighting. Such hatchlings shall be collected and released at another location on the same section of beach where these impacts are not operating. Following release, the permit holder will consult with the nighttime project supervisor to determine if the impact was avoidable and correct it to the maximum extent possible and consistent with the terms and condtions of this opinion.

6. From April 15 through November 30, staging areas for equipment and vehicles shall be located off the beach to the maximum extent practicable. If necessary, overnight storage of vehicles and construction equipment on the beach shall be limited to those in use to minimize disturbance to sea turtle nesting and hatching activities. Beach storage of materials and supplies is appropriate only on a temporary basis and if it is located on the northwest of the south jetty. Any beach storage must comply with the Volusia County beach conservation zone requirements. In addition, beach storage shall be in a manner so as to minimize impact to nesting habitat (placement perpendicular to the shoreline is recommended as the method of storage).

7. The Corps shall provide information on this species to personnel working at the proposed south jetty site to the extent necessary to comply with the previous terms and conditions.

8. In the event of an incidental mortality or injury, the U.S. Fish and Wildlife Service located in Jacksonville, Florida (904-232-2580) must be notified within 24 hours of each event. The Florida Marine Patrol (1-800-DIAL-FMP) should be notified if other dead, injured, or sick endangered or threatened sea turtle specimens are collected or observed. Care should be taken in handling these individuals to ensure effective treatment and care of the injured and to preserve dead specimens in the best possible state for later analysis. The Corps or its authorized contractor has the responsibility to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

Southeastern beach mouse

1. Prior to dune excavation, all proposed access points must be trap surveyed for beach mice, using one or more transects running perpendicular to the dunes for at

least three consecutive nights. Size of the access route will determine transect and trap numbers. A plant survey using the same transects must be conducted to determine diversity and density of vegetation. The site selected for access shall be the one which survey findings suggest will result in the minimal impact to beach mice and/or vegetation. Photographs of this site shall be taken to facilitate accurate restoration of the previous dune ecosystem to the maximum extent.

2. The excavation shall be restricted to the minimum length and width practical for providing access to vehicles and equipment. Excavated sand shall be temporarily stored between the back dunes and the boardwalk service road.

3. Foredune restoration will be accomplished by erecting snow fences and planting sea oats. Excavated sand may be used to physically re-create back dunes. The remainder of the excavated sand shall be integrated with adjacent back dunes in a manner which complements their usual physical appearance.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed alternatives. Provided that these measures are implemented, the Service believes that any incidental take resulting in mortality of Atlantic salt marsh snake and southeastern beach mouse, and false crawls of nesting sea turtles will be considered as unavoidable. The Service, however, has determined that implementing the above measures should result in the death or injury of no more than one adult sea turtle from contact with vehicles or equipment, and the incidental taking of 100 sea turtle hatchlings. If, during the course of the action, this minimized level of incidental take is exceeded, such incidental take represents new information requiring review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

Reinitiation - Closing Statement

This concludes formal consultation on the actions outlined in the Fish and Wildlife Coordination Act Report for the Ponce de Leon Navigation Improvement Study. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Coastal Barrier Resources Act

Background

The Coastal Barrier Resources Act (CBRA), first enacted in 1982 (16 U.S.C. 3502 et seq.), was reauthorized and amended by the Coastal Barrier Improvement Act (CIBA) of 1990 (16 U.S.C. 3501). Its purpose, as stated in section 2(b), is ".....to minimize the loss of human life, wasteful expenditure of Federal revenues, and the damage to fish, wildlife, and other natural resources associated with the coastal barriers....." CBRA established the Coastal Barrier Resources System, a mapped series of undeveloped coastal barriers on the Atlantic and Gulf coasts, including the Great Lakes Region, Virgin Islands, and Puerto Rico. Areas within the system are designated as either "units" or "otherwise protected areas" (OPA's). Section 5(a) prohibits all new federal expenditures and financial assistance within unit boundaries, with some exceptions as determined through a process of consultation.

Consultation

Section 6(a) of CBRA requires that the appropriate federal officer consult with the Secretary of the Interior (Secretary) prior to making commitments on Federal expenditures or financial assistance within CBRA units. The Secretary has delegated his consultation responsibility to the U.S. Fish and Wildlife Service (Service). The Service, therefore, offers the following comments on proposed improvements to navigation at Ponce de Leon Inlet, a designated CBRA unit, pursuant to Section 6.

Ponce de Leon Inlet is located on the Florida east central coast between the cities of Daytona Beach and New Smyrna Beach. The inlet and much of the adjacent coastal river wetlands east of Route 1 are grouped within the P08 unit (Figure 24). The 1993 Corps Reconnaissance Report proposed various measures to improve navigation within the inlet and adjacent portions of the Halifax and North Indian Rivers, and control erosion of the inlet's north spit. These measures include:

- extending the north and south jettys located at the inlet mouth,
- re-opening a portion of the north jetty weir,
- constructing a scour apron on the south side of the north jetty and rebuilding the damaged portions of the north jetty,
- building a groin field along the east shoreline of the north spit within the inlet throat,
- constructing a revetment from the toe end of the north jetty westward along one of three possible alignments, and
- creating a new Federal channel through the old bed of the Halifax River.

Since publicaton of the Reconnaissance Report, more than 60 additional acres of the north spit have eroded. As a result, the Corps re-reviewed the groin field alternative and determined that conditions on the north spit no longer matched the parameters under which this measure was to operate. The Corps, therefore, dropped this strategy from project consideration.

Habitats found within the Ponce Inlet unit include marine, estuarine, brackish riverine, salt marsh, mangrove swamp, tidal mud and sand flats, beaches, and coastal dunes. These habitats not only support diverse communities of both resident plants and animals, but are also important for migratory birds, including waterfowl and neotropical migrants. The extensive coastal wetlands support both shellfish and the adults and juveniles of many commercially valuable finfish. More specific information on these and other significant natural resources associated with Ponce Inlet may be found in the subsection on the description of the affected environment.

Section 6(a)(2) of CIBA provides an exception to Section 5, Limitations on Federal Expenditures Affecting the System, if the expenditure is for "the maintenance or construction of improvements of existing Federal navigation channels (including the Intracoastal Waterway) and related structures (such as jetties), including the disposal of dredge materials related to such maintenance or construction." The proposed jetty extensions, north jetty weir re-opening, and north jetty repair and scour apron are actions which qualify under this exception.

Subsections 6(a)(6A-F) of CBRA also provide exceptions to section 5, provided that the actions or projects are consistent with the purposes of CBRA as previously stated. The proposed new channel and rock revetment would greatly reduce or eliminate, respectively, the erosion potential of facilities within Lighthouse Point County Park, located on the north spit. These measures thus could be considered under subsection 6(F), which exempts expenditures and assistance for "the maintenance, replacement, reconstruction, or repair, but not the expansion, of publicly owned or publicly operated roads, structures, or facilities," Both actions are also consistent with the purposes of CBRA because

- they will contribute to increased inlet navigability, which should minimize the existing risk of loss of human life,

- current Federal expenditures for inlet renourishment and containment of inlet breaching will be eliminated and dredging for shoal removal will be greatly reduced, and

- the expected habitat loss from the actions is offset by the anticipated conservation of nearby habitat supporting similar fish, wildlife, and other natural resources within the unit that otherwise might be lost to uncontrolled erosion.

Based on the preceding review, the Service concludes that the proposed jetty extensions, north jetty weir re-opening, and north jetty repair and scour apron are exempted under Section 6(a)(2) and the engineered channel and rock revetment are exempted under Section 6(a)(6F).

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